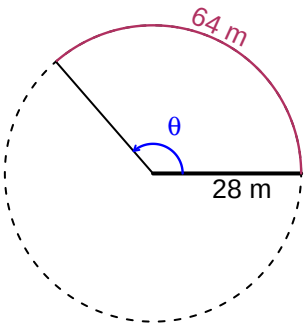
Name: Date:

## Trig Final (Solution v45)

- You should have a calculator (like Desmos) and a unit-circle reference sheet.

### Question 1

In the figure below, we see a circle and a central angle that subtends an arc. The arc length is 64 meters. The radius is 28 meters. What is the angle measure in radians?

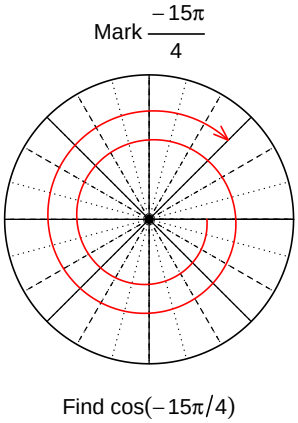



$$\theta = \frac{L}{r} \qquad r = \frac{L}{\theta} \qquad L = r\theta$$

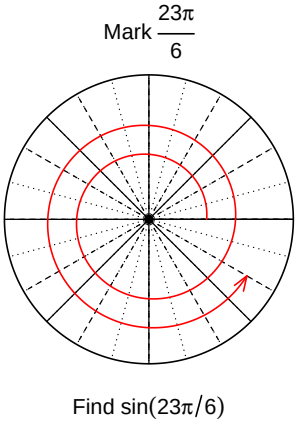
$\theta = 2.286$ radians.

### Question 2

Consider angles $\frac{-15\pi}{4}$ and $\frac{23\pi}{6}$. For each angle, use a spiral with an arrow head to **mark** the angle on a circle below in standard position. Then, find **exact** expressions for $\cos\left(\frac{-15\pi}{4}\right)$ and $\sin\left(\frac{23\pi}{6}\right)$ by using a unit circle (provided separately).




Find $\cos(-15\pi/4)$




Find $\sin(23\pi/6)$

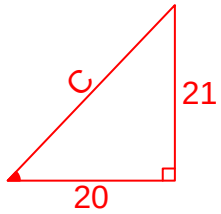
$\cos(-15\pi/4) = \frac{\sqrt{2}}{2}$

$\sin(23\pi/6) = \frac{-1}{2}$

**Question 3**

If $\tan(\theta) = \frac{-21}{20}$, and $\theta$ is in quadrant II, determine an exact value for $\sin(\theta)$.

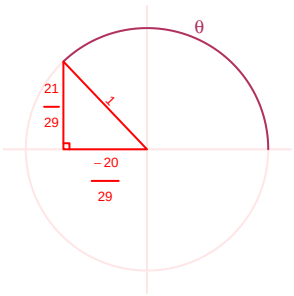
Ignore any negatives and the quadrant, and draw a right triangle (based on SOHCAHTOA) in standard (quadrant I) orientation.




Solve the Pythagorean Equation

$$20^2 + 21^2 = C^2$$
$$C = \sqrt{20^2 + 21^2}$$
$$C = 29$$

Rescale the triangle so the hypotenuse is 1. Reflect the triangle into Quadrant II in a unit circle.




$$\sin(\theta) = \frac{21}{29}$$

**Question 4**

A mass-spring system oscillates vertically with a frequency of 4.24 Hz, a midline at $y = -6.1$ meters, and an amplitude of 2.9 meters. At $t = 0$, the mass is at the maximum height. Write an equation to model the height ($y$ in meters) as a function of time ($t$ in seconds).

Any of these equations would get full credit.

$$y = 2.9\cos(2\pi 4.24t) - 6.1$$

or

$$y = 2.9\cos(8.48\pi t) - 6.1$$

or

$$y = 2.9\cos(26.64t) - 6.1$$